

CLAIMS

What Is Claimed Is:

1. A differential casing comprising:

(a) a chamber, having an axle centerline and defined by
5 at least one spherical surface and at least one opposing
surface, wherein the centerpoint of said at least one
spherical surface is substantially collinear with said axle
centerline is offset from the centerpoint of said chamber by
an offset distance along said axle centerline in a direction
10 away from said opposing surface.

2. A differential casing as in claim 1 wherein the ratio of
the radius of said at least one spherical surface to said
offset distance is at 30.

3. An automotive differential mechanism comprising:

- (a) a first and second side gear; and
(b) a differential chamber formed by offsetting the
spherical centerpoint of said first side gear away
20 from the surface of said second side gear.

4. An automotive differential mechanism comprising:

- (a) a pinion shaft;
(b) a first pinion gear;
25 (c) a second pinion gear;
(d) a first side gear, having a first side gear outer
radius;
(e) a second side gear having a second side gear outer
radius; and,

5 (f) a differential casing having a first axle shaft port, a second axle shaft port, a first inner radius, a first radius center point, a second inner radius and a second radius center point, wherein said second radius center point is offset a distance from said first radius center point such that when said first and second pinion gears, said pinion shaft and said first and second side gears are installed within said differential casing, said pinion gears and said pinion shaft force said first side gear outer radius into said first inner radius and said second side gear outer radius into said second inner radius such that said first side gear is substantially aligned with said first axle shaft port and said second side gear is substantially aligned with said second axle shaft port.

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15 5. An automotive differential mechanism according to claim 4 wherein said first and second side gears do not have alignment shoulders.

20 6. A differential mechanism comprising:

(a) a casing adapted to be rotatably driven about an axis of rotation and having a chamber defined by walls;

25 (b) a pair of pinion gears retained within said chamber rotatable about an axis of rotation normal to and having an intersection point with said axis of rotation of said casing;

30 (c) a pair of side gears having a part-spherical endwall;

(d) means for retaining said side gears from rotating within said chamber about the axis of rotation of

said pinion gears including a pair of part-spherical regions defined in said chamber, each said region being defined by a wall of said chamber having a spherical shape substantially complementary to the end wall of one of said side gears and each said region providing a recess in said chamber for supporting one of said side gears;

- (e) each of said side gear receiving part-spherical regions comprising part of a sphere having a center located on said axis of rotation of said casing and offset from said intersecting point in a direction providing a chamber extending more in the axial direction of said casing than in the direction of the axis of rotation of said pinion gears.

7. A method of assembling a differential mechanism having at least one spherical side gear, two pinion gears and a pinion shaft comprising the steps of:

- (a) forming a casing with at least one spherical surface substantially complementary with a spherical surface of at least one spherical side gear;
- (b) inserting at least one spherical side gear into said casing so that said spherical side gear is held in place by virtue of contact between said at least one spherical side gear and said complementary casing spherical surface and the support provided by said two pinion gears and said pinion shaft.